[Original Article]

Physiological and Psychological Effects of Using the Body-Enveloping "CALM CHAIR" with Relaxation Benefits: Analysis in Typically Developing Children and Comparison with Data from Children with Developmental Disabilities

Reiko Kamiji
Faculty of Integrated Human Studies, Department of Business Psychology, Sanyo Gakuen University

Ren Nii
Development Department, OM Kiki Co.,Ltd.

Masaru Itami
Development Department, OM Kiki Co.,Ltd.

Shingo Oki
Development Department, OM Kiki Co.,Ltd.

Seiji Yuasa
Development Department, OM Kiki Co.,Ltd.

Abstract

This study investigated the physiological and psychological effects of the "CALM CHAIR," *1 a body-expanding chair designed for relaxation, on typically developing children and compared the results with data from children with developmental disabilities. The subjects were 24 typically developing children (9 boys and 15 girls, aged 6–10 years) who sat for 5 min each on a school chair and the CALM CHAIR. Physiological measurements (heart rate and skin temperature) and subjective evaluations were also performed.

The results showed that the use of the CALM CHAIR significantly decreased the heart rate ($p < .01$, $d = 0.57$) and increased the skin temperature ($p < .01$, $d = -1.24$) compared with the regular chair, indicating enhanced parasympathetic nervous system activity. In the subjective evaluation of psychological effects, the CALM CHAIR was rated significantly higher in terms of comfort ($p < .01$, $d = -0.74$). These findings are similar to those reported by Kamiji et al. (2024) in children with developmental disabilities. Moreover, children with developmental disabilities exhibit more pronounced physiological responses, particularly heart rate variability, suggesting potential difficulties in autonomic nervous system regulation. The use of the CALM CHAIR resulted in relaxation effects in both groups, indicating its potential as an effective tool for stress management and environmental adaptation, especially in children with sensory sensitivities.

Keywords: hildren with developmental disabilities, relaxation, chair, CALM CHAIR

1. Introduction

Individuals with developmental disabilities often experience sensory hypersensitivity and difficulty in sensory processing, leading to increased stress and anxiety in daily life (Wada et al., 2023). Particularly in children with developmental disabilities, hypersensitivity to sensory stimuli is high; these children may exhibit difficulties processing sensory information such as auditory, visual, and tactile inputs. Sensory hypersensitivity affects the regulatory function of the autonomic nervous system, triggering physiological responses such as increased heart rate and decreased skin temperature under stress (Baranek et al., 2006). In this study, the term "children with developmental disabilities" refers to those diagnosed with autism spectrum disorder (ASD), attention-deficit/hyperactivity disorder (ADHD), or mild intellectual disabilities, in accordance with the Japanese Act on Support for Persons with Developmental Disabilities.

It has been reported that children with developmental disabilities, especially those with ASD, tend to have higher resting heart rates compared to typically developing children (Takeshima & Seiwa, 1993). Additionally, Porges (2007) proposed the polyvagal theory, suggesting a relationship between the autonomic nervous system function, social behavior, and emotional regulation. This theory provides an important perspective for understanding the relationship between physiological responses and behavior in children with developmental disabilities. Yamashita (2015) pointed out that individuals with ASD exhibit greater emotional responses to stress. These studies suggest a link between sensory hypersensitivity and physiological responses, emphasizing the importance of appropriate environmental adjustments and stress management. To objectively evaluate the effects of such interventions, heart rate and skin temperature were selected as physiological measures because they are non-invasive, real-time indicators of autonomic nervous system activity and have been shown in previous studies to reliably reflect relaxation responses through parasympathetic activation (Darki et al., 2022; Itao et al., 2018). Heart rate tends to decrease during relaxation, while skin temperature increases due to peripheral vasodilation associated with parasympathetic activation. These changes are consistent with reductions in sympathetic arousal and can serve as non-invasive markers for evaluating relaxation effects.

Given this background, various relaxation techniques have been explored to reduce stress and regulate behavior in children with developmental disabilities. For example, in the field of music therapy, Miyake (2011) reported the effectiveness of rhythmic activities for developmental support in children with developmental disabilities. Moreover, focusing on sensory stimulation, Onishi and Kumagai (2019) developed a learning method (somatosensory method) that considered the cognitive processing styles and somatosensory input methods of children with developmental disabilities, finding it improved the accuracy rate of kanji writing.

In particular, deep pressure stimulation (DPS) has garnered attention as a technique for reducing anxiety and promoting relaxation (Grandin, 1992), with the enveloping pressure believed to provide a sense of security. Based on this DPS concept, Kamiji et al. (2024) developed a body-enclosing chair, "CALM CHAIR", aimed at relaxing children with developmental disabilities, and conducted a study to validate its effectiveness. The results showed that compared to a regular chair, the CALM CHAIR significantly reduced the average heart rate and increased the average skin temperature, suggesting a relaxation effect on the mind and body. Additionally, subjective evaluations by the children (relaxation level and comfort) and observational evaluations by the instructors (level of calmness) were significantly higher when using the CALM CHAIR. These results support the theory of DPS and indicate its potential to aid stress management in children with sensory hypersensitivity.

However, the effectiveness of the CALM CHAIR has only been verified in studies involving children with developmental disabilities, and its effects on typically developing children have not been investigated. A comparative analysis between these two groups has yet to be conducted. Therefore, this study aimed to analyze the effects of using the CALM CHAIR on physiological indicators (heart rate and skin temperature) and subjective psychological states in typically developing children and compare these findings with data from children with developmental disabilities.

Based on sensory integration theory, we hypothesized that children with developmental disabilities would exhibit more pronounced physiological changes when seated in the CALM CHAIR, which provides DPS, compared to typically developing children. Specifically, we expected that the use of the CALM CHAIR would promote parasympathetic nervous system activity, leading to a decrease in heart rate and an increase in skin temperature.

2. Methods

2.1 Target Child

The study included 28 typically developing children (9 boys and 19 girls) weighing less than 50 kg. All participants were enrolled in regular elementary school classes and had no history of developmental disorders, cardiovascular disease, or other medical conditions that could affect autonomic nervous system function. Their ages ranged from 6 to 10 years (M = 8.11, SD = 1.16). Children who had a fever, were feeling unwell on the day of the experiment, or had engaged in vigorous physical activity immediately before measurement were excluded from participation.

2.2 Procedure

Participants were tested in pairs in a classroom with the air conditioner set to 25°C. Humidity was not measured. The two subjects sat with their backs to each other so that they could not see one another during the experiment.

Each participant completed two consecutive conditions: (1) sitting on a standard school chair for 5 minutes, followed immediately by (2) sitting on the CALM CHAIR for 5 minutes. The order of conditions was fixed for all participants to ensure procedural consistency; therefore, potential order effects could not be ruled out and are addressed in the Limitations section.

For the school chair condition, participants were simply instructed to “Please sit on the chair.” For the CALM CHAIR condition, participants were told that their hips would sink deeply into the seat when they sat down. In both conditions, participants remained seated without speaking and refrained from unnecessary movements throughout the measurement period. Psychological and physiological evaluations were conducted continuously during each condition, as described below.

2.2.1 Physiological Evaluation

(1) Sitting posture observation: Sitting postures were recorded on video for later observation and qualitative assessment.

(2) Changes in heart rate: Heart rate was measured continuously using an arm-worn optical heart rate sensor (Polar OH1+, Polar Electro, Kempele, Finland). Although the manufacturer does not explicitly state the accuracy, previous validation studies have confirmed its reliability. Hettiarachchi et al. (2019) compared Polar OH1 measurements with electrocardiography (ECG) during treadmill walking and cycling at moderate to high intensities, reporting intraclass correlation coefficients above 0.95 across forearm, upper arm, and temple placements, with mean biases less than 3 bpm. These results indicate that the Polar OH1 provides sufficient accuracy for physiological research settings.

(3) Changes in skin temperature: Skin temperature was measured using a smartphone-compatible infrared camera (FLIR ONE PRO, FLIR Systems, Wilsonville, OR, USA; thermal resolution 160 × 120 pixels, accuracy ± 3°C or ± 5%, whichever is greater). The camera was positioned

approximately 1 m from the participant's face and hands to capture consistent thermal images.

All physiological indicators were recorded continuously from the start of the school chair condition until the end of the CALM CHAIR condition. Heart rate data were recorded at 1-second intervals, and thermal images were captured every 5 seconds. The same devices and measurement protocols were used for all participants.

2.2.2 Psychological Evaluation

Subjective assessment: Immediately after completing each seating condition, participants were asked to rate their experience with the chair they had just used. Semi-structured interviews were conducted by the researchers, who were trained in working with children, to ensure that the questions were easily understood.

Participants rated each chair on a 5-point Likert scale with the following anchors: 1 = "very bad," 2 = "bad," 3 = "neutral," 4 = "good," and 5 = "very good." Children were also encouraged to explain the reasons for their ratings in their own words, and brief notes of these comments were recorded for qualitative reference.

2.2.3 Analysis Method

Paired-sample t-tests (two-tailed) were used to compare physiological and psychological outcomes between the school chair and the CALM CHAIR conditions. Independent-sample t-tests (two-tailed) were used to compare results between children with developmental disabilities and typically developing children. Prior to conducting t-tests, the Shapiro-Wilk test was applied to confirm the normality of the data distributions.

Effect sizes were calculated as Cohen's d, interpreted as small (0.20), medium (0.50), or large (0.80) according to conventional benchmarks. The significance level was set at $p < .05$. All statistical analyses were performed using JASP version 0.17.1 (JASP Team, Amsterdam, The Netherlands). Missing data were excluded pairwise from the relevant analyses.

2.3 Ethical Considerations

This study was approved by the Ethics Committee of Sanyo Gakuen University (approval number: A2024U002) and was conducted in accordance with the principles of the Declaration of Helsinki. The purpose, procedures, potential risks, and benefits of participation were explained in writing and verbally to both the children and their guardians. Written informed consent was obtained from the guardians, and verbal assent was obtained from the children. All data were anonymized, and care was taken to minimize potential risks to participants throughout the study.

3. Results

After reviewing the video footage of the experiment, four children who remained excited and could not be measured correctly were excluded. The final analysis included 24 typically developing children (9 boys and 15 girls) aged 6–10 years ($M = 8.08$, $SD = 1.18$).

3.1 Physiological Evaluation

3.1.1 Sitting Posture Observation

Video analysis showed that many participants appeared relaxed when using the CALM CHAIR (Figure 1).

3.1.2 Changes in Heart Rate and Skin Temperature

Average heart rate was significantly lower when participants were seated in the CALM CHAIR

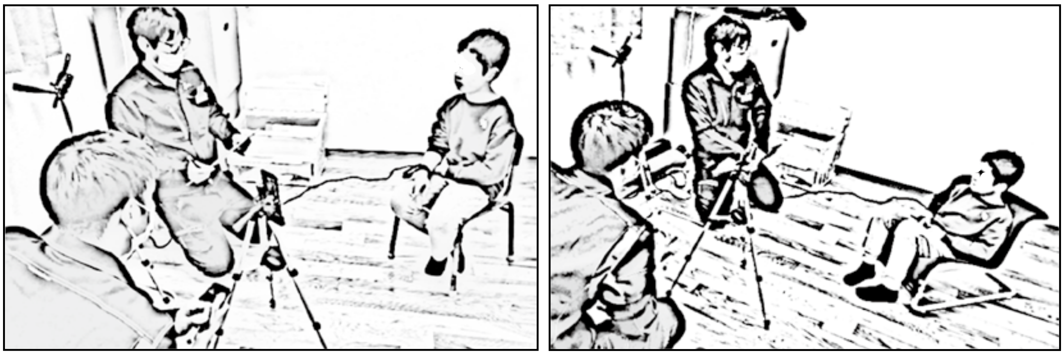
（M = 97.75, SD = 9.22） compared with the school chair （M = 100.35, SD = 9.34; t （23） = 2.81, p < .01, d = 0.57） （Figure 2）. This moderate effect size suggests that the use of the CALM CHAIR was associated with a decrease in heart rate.

3.1.3 Skin Temperature Changes

Figure 3 shows an example of skin temperature distribution captured by an infrared camera when using the school chair （left） and the CALM CHAIR （right）. The average skin temperature was significantly higher when using the CALM CHAIR （M = 35.41, SD = 1.21） compared with the school chair （M = 34.69, SD = 1.11; t （23） = −6.05, p < .01, d = −1.24） （Figure 4）. This large effect suggests that the CALM CHAIR has a strong influence on increasing skin temperature.

3.2 Psychological Evaluation

Comfort ratings were significantly higher for the CALM CHAIR （M = 4.57, SD = 0.84） than for the school chair （M = 3.36, SD = 1.16; t （23） = −3.92, p < .01, d = −0.74） （Figure 5）. This medium-to-large effect size indicated that the CALM CHAIR was perceived as more comfortable.



When using school chairs　　When using the CALM CHAIR

Figure 1 Sitting in a chair during the experiment

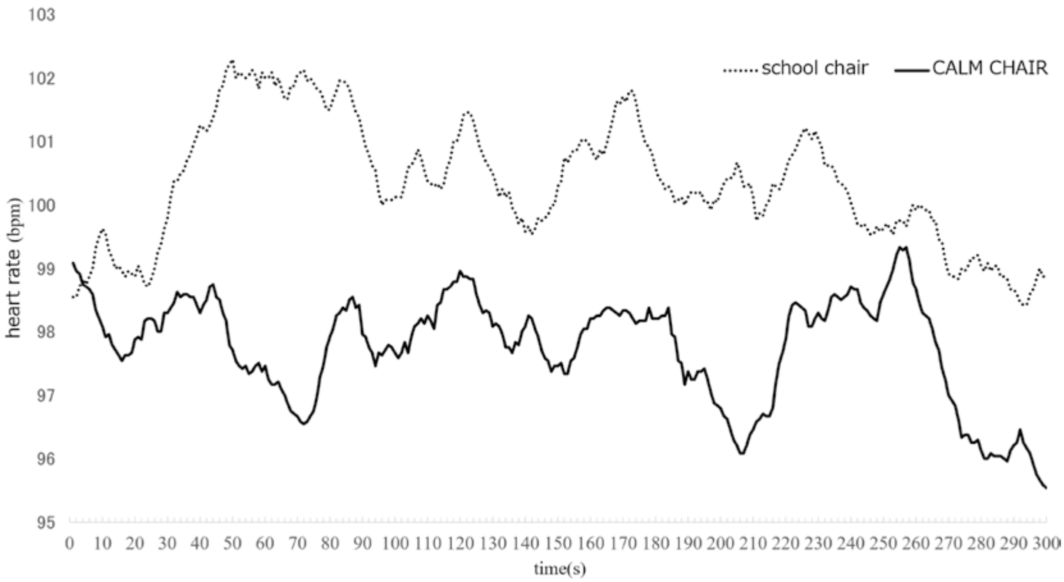


Figure 2 Heart rate variability during school chair and the CALM CHAIR use in typically developing children

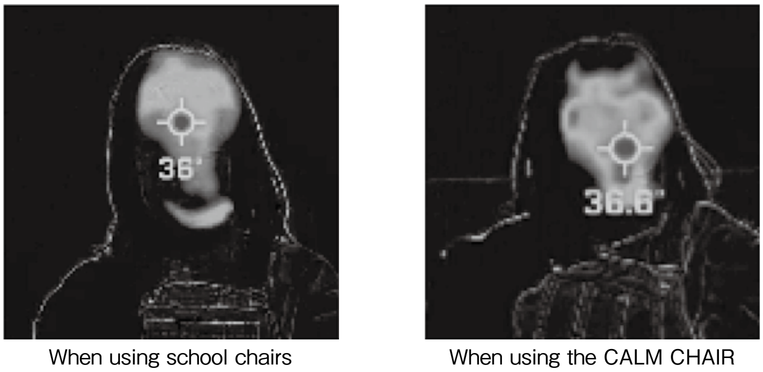


Figure 3 Skin temperature change during the experiment

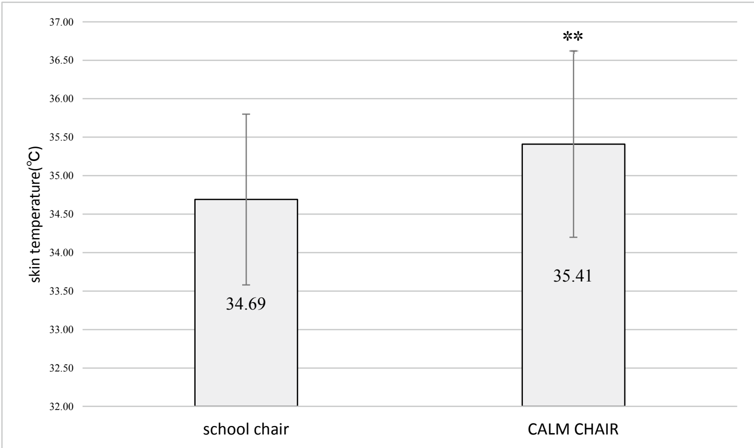


Figure 4 Results of t-test for skin temperature measured by infrared camera during use of school chair and the CALM CHAIR
Note: Mean ± SD. **p < .01.

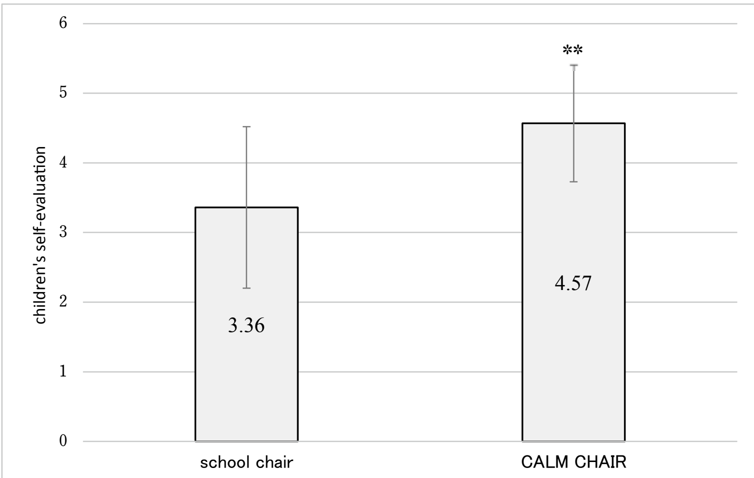


Figure 5 Results of t-test comparing comfort ratings between the school chair and the CALM CHAIR in typically developing children
Note: Mean ± SD. **p < .01.

4. Discussion

This study evaluated the impact of the CALM CHAIR on psychological and physiological responses in typically developing children by measuring heart rate, skin temperature, and subjective comfort ratings, compared with regular school chairs. The results suggest that the CALM CHAIR may provide relaxation effects in typically developing children, consistent with those observed in children with developmental disabilities in a previous study by Kamiji et al. (2024).

Physiological indicators revealed a significant decrease in the average heart rate and a significant increase in the average skin temperature when using the CALM CHAIR. A decreased heart rate is associated with increased parasympathetic nervous system activity and is widely recognized as an indicator of relaxation (Porges, 2007). These physiological changes suggest a reduction in the stress response, indicating that the CALM CHAIR may help alleviate physical tension.

Children with developmental disabilities (Kamiji et al., 2024) showed a significantly larger initial drop in heart rate compared with typically developing children (Figure 6: school chair; Figure 7: CALM CHAIR). These figures illustrate potential differences in physiological responses between the two groups, and such a pronounced early decrease may represent a physiological response specific to children with developmental disabilities. Individuals with developmental disabilities, especially those with ASD, have been reported to show stronger emotional reactions to stress (Yamashita, 2015). This rapid drop in heart rate can be interpreted as an adaptive reaction to unfamiliar environments or as a manifestation of sensory hypersensitivity. Children with ASD, in particular, often have difficulty regulating physiological arousal and tend to have higher resting heart rates than typically developing children (Takeshima & Seiwa, 1993). Additionally, Matsushima et al. (2016) found that school-age children with developmental disabilities generally exhibit lower parasympathetic activity involved in self-regulation.

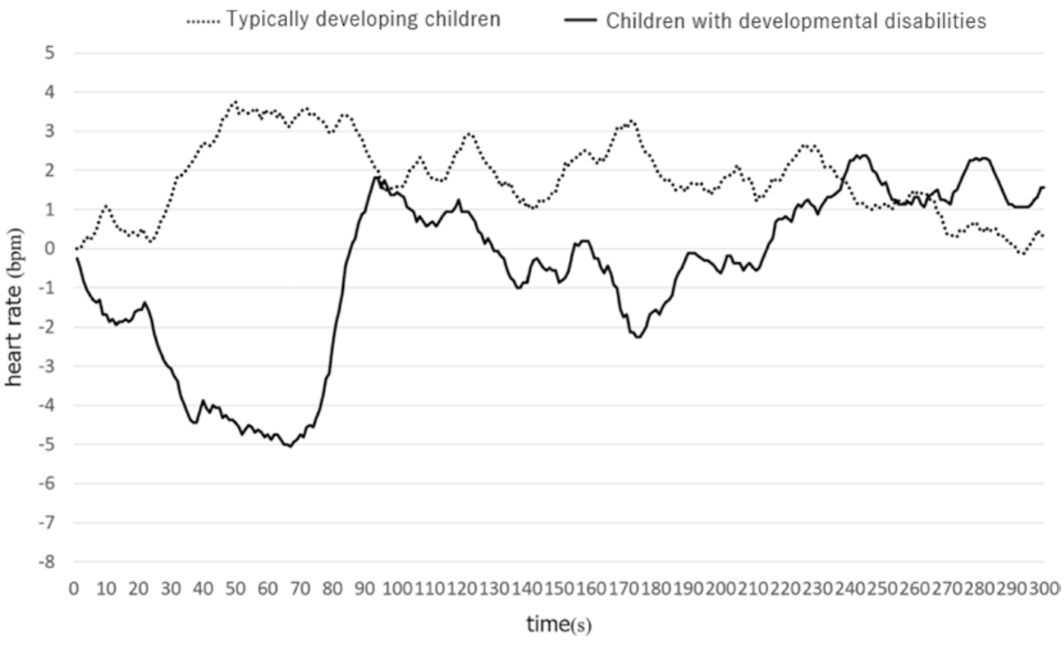


Figure 6 Changes in heart rate from initial baseline when using a school chair in children with developmental disabilities and typically developing children (adapted from Kamiji et al., 2024).

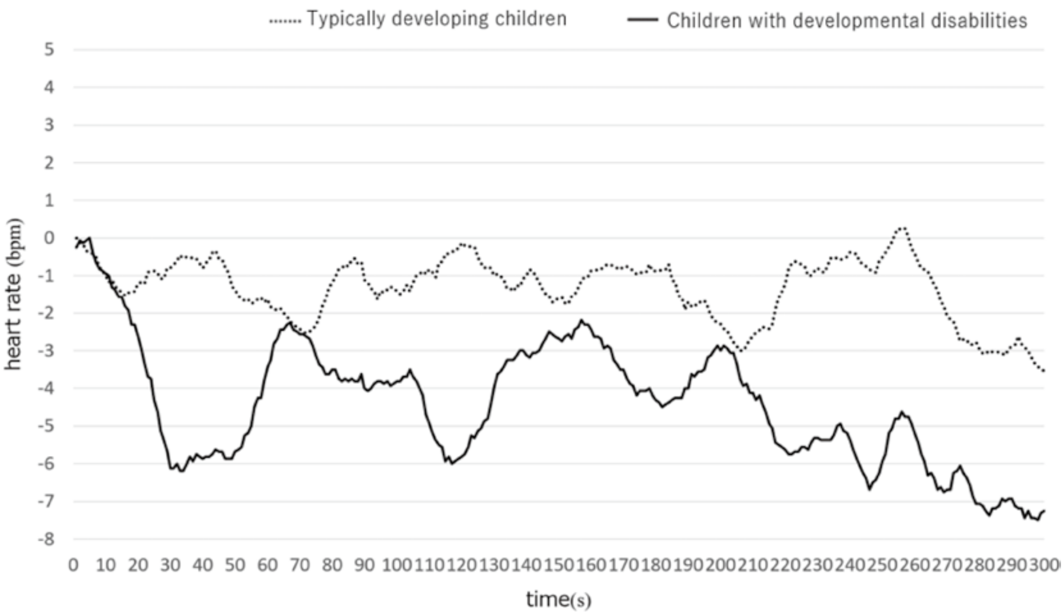


Figure 7 Changes in heart rate from initial baseline when using the CALM CHAIR in children with developmental disabilities and typically developing children (adapted from Kamiji et al., 2024).

Furthermore, this study revealed that children with developmental disabilities showed significantly greater changes in heart rate over time than typically developing children, both when using a school chair and the CALM CHAIR. This finding suggests that autonomic nervous system regulation in children with developmental disabilities may be less stable. Differences in sensory processing have been shown to affect physiological responses in these children (McIntosh et al., 1999), who tend to show excessive reactions to novel stimuli or unpredictable environmental changes compared to typically developing children (Ben-Sasson et al., 2009; Rodgers et al., 2012).

In terms of psychological indicators, subjective evaluations were significantly higher when using the CALM CHAIR, suggesting that it provides comfort and is a preferred seating experience for typically developing children. This result indicates that the CALM CHAIR not only promotes physiological relaxation but also provides psychological comfort. Children with developmental disabilities often show hypersensitive reactions to sensory stimuli (Baranek et al., 2006), and environmental adjustments such as the CALM CHAIR may help promote psychological stability.

From the perspective of sensory integration theory, the CALM CHAIR's body-enveloping design and moderate pressure may stimulate proprioceptive and tactile senses, potentially mitigating sensory hypersensitivity (Grandin, 1992). Deep pressure stimulation has been shown to calm the nervous system and promote relaxation (Ayres, 1972), providing a plausible mechanism for the observed effects. Compared with auditory-based calming interventions, which are often limited by individual differences in sound sensitivity (Maeda, 2014), tactile-based approaches such as the CALM CHAIR may be more broadly applicable.

Research on the relaxation effects of touch has demonstrated increased parasympathetic activity and decreased sympathetic activity (Kondo et al., 2012), a pattern similar to that observed here. However, unlike conventional touch therapy, the CALM CHAIR does not require direct human contact, allowing individuals to maintain personal space while receiving relaxation benefits.

Overall, these findings suggest that the CALM CHAIR may serve as a supportive environmental tool for children with sensory or attentional difficulties. The National Institute of Special Needs Education (2012) has noted links between developmental disabilities and emotional disorders, indicating that appropriate environmental adjustments may also help prevent secondary emotional problems.

Future research should investigate the long-term effects of CALM CHAIR use, its applicability across age groups and disability types, and potential synergistic effects when combined with other relaxation strategies.

5. Conclusion

This study demonstrated that the CALM CHAIR provides both physiological and psychological relaxation effects in typically developing children, as shown by a decrease in heart rate, an increase in skin temperature, and higher subjective comfort ratings. These effects are consistent with previous findings in children with developmental disabilities (Kamiji et al., 2024), although children with developmental disabilities exhibited a significantly larger initial drop in heart rate than typically developing children. The results suggest that the CALM CHAIR may serve as an effective environmental intervention for children with sensory hypersensitivity, supporting both physical relaxation and emotional stability while allowing them to maintain personal space.

6. Limitations

This study has several limitations that should be acknowledged. First, the sample size was relatively small, which may limit the statistical power and reduce the ability to detect subtle effects. However, the effect sizes observed for heart rate ($d = 0.57$), skin temperature ($d = -1.24$), and comfort ratings ($d = -0.74$) were in the medium-to-large range, suggesting that the detected differences are likely to be meaningful despite the limited sample size. Replication with larger samples will be important to confirm these findings. Second, the study employed a short-term experimental design; therefore, the long-term effects of CALM CHAIR use remain unknown. Third, participants were limited to typically developing children aged 6-10 years and weighing less than 50 kg, which may restrict generalizability to other populations. Fourth, the study compared typically developing children only with children with developmental disabilities as reported in Kamiji et al. (2024). No direct comparisons were conducted with adults, and such comparisons will be important in future research. Fifth, the order of chair conditions was fixed, which may have introduced order effects.

Future studies should employ randomized or counterbalanced designs, include larger and more diverse samples, and investigate potential synergistic effects when the CALM CHAIR is combined with other relaxation strategies.

Conflict of Interest Statement

The CALM CHAIR used in this study was designed and manufactured based on a joint R&D agreement between Kamiji and OM Equipment Co., Ltd. Under this agreement, Kamiji received the research funds necessary for the design and prototyping of the CALM CHAIR from OM Equipment Co., Ltd. Nii, Itami, Oki, and Yuasa are employees of OM Equipment Co., Ltd. and were responsible for the design, manufacturing, and data collection of the CALM CHAIR in this study. To ensure the independence of the research, Kamiji primarily conducted the study design, data analysis,

interpretation of results, and manuscript writing without corporate involvement.

Acknowledgments

We would like to express our sincere appreciation to the staff of the Okayama Prefecture Child Support Class "Kirari" Bizen Mikado School and the Okayama City Hirafuku Elementary School Children's Club Bamboo Shoot Club for their cooperation in conducting this study, and to the children and their parents for their cooperation in the experiments.

Note

The chair is constructed to envelop the body for relaxation purposes developed by Kamiji et al. in 2024 (Patent pending). It is designed to provide continuous support from the back to the buttocks, sinking along the natural curves of the body and providing moderate pressure sensation from the soft fabric. In addition, the fabric is made of a material that stretches as it sinks in response to body weight, providing soft stimulation to the skin sensation.

References

Ayres, A. J. (1972). Sensory integration and learning disorders. Western Psychological Services.

Baranek, G. T., David, F. J., Poe, M. D., Stone WL, Watson, L. R. (2006). Sensory experiences questionnaire: Discriminating sensory features in young children with autism, developmental delays, and typical development. Journal of Child Psychology and Psychiatry, 47(6), 591-601. doi: 10.1111/j.1469-7610.2005.01546.x.

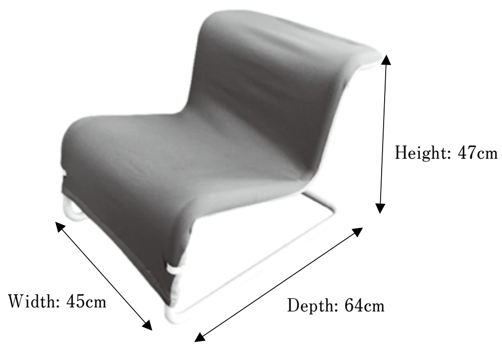
Ben-Sasson, A., Cermak, S. A., Orsmond, G. I., Tager-Flusberg, H., Kadlec, M. B., & Carter, A. S. (2009). Sensory clusters of toddlers with autism spectrum disorders: Differences in affective symptoms. Journal of Child Psychology and Psychiatry, 50 (8), 817-825. doi: 10.1111/j.1469-7610.2008.01899.x.

Darki C, Riley J, Dadabhoy DP, Darki A, Garetto J. (2022). The Effect of Classical Music on Heart Rate, Blood Pressure, and Mood. Cureus. 14 (7) : e27348. doi: 10.7759/cureus.27348.

Grandin, T. (1992). Calming effects of deep touch pressure in patients with autistic disorder, college students, and animals. Journal of Child and Adolescent Psychopharmacology, 2 (1), 63-72. doi: 10.1089/cap.1992.2.63.

Hettiarachchi, I. T., Hanoun, S., Nahavandi, D., & Nahavandi, S. (2019). Validation of Polar OH1 optical heart rate sensor for moderate and high intensity physical activities. PLOS ONE, 14 (5), e0217288. doi: 10.1371/journal.pone.0217288.

Itao, K. , Komazawa, M. and Kobayashi, H. (2018). A Study into Blood Flow, Heart Rate Variability, and Body Surface Temperature While Listening to Music. Health, 10, 181-188. doi: 10.4236/health.2018.102015.



Kamiji, R., Nii, R., Itami, M., Oki, S., & Yuasa S. (2024). Hattatsu shogaiji ga rirakkusu wo erareru koto wo mokuteki to shita shintai wo tsutsumu isu “CALM CHAIR,” no kouka kenshou : [Verification of the effects of “CALM CHAIR,” a body-wrapping chair designed to help children with developmental disabilities relax]. Sanyo Ronso, 31, 15-25. (in Japanese).

Kondo, H., Komiya, H., & Urao, Y. (2012). Iyashi gihou toshite no tacchi no ukete to shikousha ni okeru kouka ni kansuru kenkyu : [Research on the effects of touch as a healing technique on recipients and practitioners]. Tokyo Health Care University Bulletin, 7 (1), 1-10. (in Japanese).

Maeda, K. (2014). Hattatsu shogai no aru hito no panikku/koufun joutai ni taisuru on shigeki ni yoru kaamudown kouka : [Calm-down effect of sound stimuli on panic and excitement states in people with developmental disabilities]. Research Report. (in Japanese)

Matsushima K, Matsubayashi J, Toichi M, Funabiki Y, Kato T, Awaya T, Kato T. (2016). Unusual sensory features are related to resting-state cardiac vagus nerve activity in autism spectrum disorders. Research in Autism Spectrum Disorders, 25, 37-46. doi:10.1016/j.rasd.2015.12.006.

McIntosh, D. N., Miller, L. J., Shyu, V., & Hagerman, R. J. (1999). Sensory-modulation disruption, electrodermal responses, and functional behaviors. Developmental Medicine & Child Neurology, 41 (9), 608-615. doi: 10.1017/s0012162299001267.

Miyake, H. (2011). Youji ki no hattatsu shien wo mokuteki to suru ritomikku ni okeru taishou rikai : [Understanding of subjects in rhythmics for developmental support in early childhood]. Dalcroze Music Education Research, 36, 29-42. (in Japanese).

National Institute of Special Needs Education. (2012). Hattatsu shogai to jyoudou shogai no kanren to kyouikuteki shien ni kansuru kenkyu : [Research on the relationship between developmental disabilities and emotional disorders and educational support]. Research Report. (in Japanese).

Onishi, S., & Kumagai, K. (2019). Kanji shoji no shutoku ga konnan na gakushu shogaiji ni taisuru ninchi shori youshiki to taiseikankaku no nyuuryoku houhou ni hairyo shita gakushuhou no hikaku: [Comparison of learning methods considering cognitive processing style and somatosensory input method for children with learning disabilities who have difficulty in acquiring kanji writing]. LD Research, 28 (3), 363-376. (in Japanese).

Porges, S. W. (2007). The polyvagal perspective. Biological psychology, 74 (2), 116-143. doi: 10.1016/j.biopsycho.2006.06.009.

Rodgers, J., Glod, M., Connolly, B., & McConachie, H. (2012). The relationship between anxiety and repetitive behaviours in autism spectrum disorder. Journal of Autism and Developmental Disorders, 42 (11), 2404-2409. doi: 10.1007/s10803-012-1531-y.

Takeshima, A., & Seiwa, H. (1993). Jiheishō ni mirareru kōdō to jiritsushinkei kei no kakusei suijun: Anzējishin hakusu no nankan hendō to kōdō no kankei : [A Study of Relationship between Behavior and Autonomic Arousal Level in Autism (III) : The Relationship between Their Behavior and Fluctuation of Heart Rate Level between Days]. Memoirs of the Faculty of Integrated Arts and Sciences, Hiroshima University. IV, Science reports, 19, 151-158. (in Japanese).

Wada, M., Hayashi, K., Seino, K., Ishii, N., Nawa, T., & Nishimaki, K. (2023). Qualitative and quantitative analysis of self-reported sensory issues in individuals with neurodevelopmental disorders. Frontiers in Psychiatry, 14, 1077542. doi: 10.3389/fpsyt.2023.1077542.

Yamashita, T. (2015). Kodomo no mentaru herusu: Jiheishou supekutoramu wo chushin ni : [Children's mental health: Focusing on autism spectrum disorders]. Japanese Journal of Psychosomatic Medicine, 55 (12), 1329-1334. (in Japanese).